DOCUMENT RESUME

ED 325 359 SE 051 695

AUTHOR Munger, Fredi; Shader, Holly
TITLE Skills Drills: A Self-Correcting Math Proficiency Game. Technical Note No. 28.
INSTITUTION Massachusetts Univ., Amherst. Center for International Education.
REPORT NO ISBN-0-932288-81-2
PUB DATE 89
NOTE 43p.
AVAILABLE FROM Center for International Education Publications Officer, 285 Hills South, University of Massachusetts, Amherst, MA 01003 ($2.00).
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Arithmetic; Computation; Elementary Education; *Elementary School Mathematics; *Games; *Learning Activities; Mathematics Education; *Mathematics Skills; Number Concepts; *Numbers; Primary Education; Problem Solving; Skill Development; Thinking Skills

ABSTRACT

This is an effective drill and practice activity that does not use consumable materials. It does not teach math facts, algorithms or concepts. It provides immediate feedback to the learner and can be easily modified for use in many curriculum areas. It is self correcting because the student can identify errors without assistance and provides skills practice materials. The materials can be used with lower primary children once they can identify numerals 1 through 12. Lower grades have used the material to reinforce basic number facts, shapes, and sizes. Older students have used the same material to identify equivalences of fractions, apply division and multiplication algorithms, and work computations involving currency and time. The procedures for preparing master pattern sheets, question sheets, and solution card blanks and the instructions to make a "Skills Drills" box and tiles are included. (KR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

The material described in this Technical Note originated in Indonesia and was further developed in Lesotho by the Basic & Nonformal Education Systems project and the Government of Lesotho.

TECHNICAL NOTE NUMBER 28

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
Cliff Meyers
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED325359

SKILLS DRILLS

A Self-Correcting Math Proficiency Game

Note Written By: Fredi Munger and Holly Shader

SE051695

SUMMARY: This technical note presents an effective and practical self-correcting math skills activity. Included is description of how to play, make and train teachers to use Skills Drills, as well as discussion of its costs and benefits.

1. THE ECUADOR PROJECT: Discusses the basic goals, philosophy and methodology of a rural nonformal education project.
2. CONSCIENTIZACAO AND SIMULATION GAMES: Discusses Paulo Freire's education philosophy and the use of simulation games for consciousness raising.
3. HACIENDA: Describes a board game simulating economic and social realities of the Ecuadorian Sierra.
4. MERCADO: Describes a card game which provides practice in basic market mathematics.
5. ASHTON-WARNER LITERACY METHOD: Describes a modified version of Sylvia Ashton-Warner's approach to literacy training used in Ecuadorian villages.
6. LETTER DICE: Describes simple, participatory letter fluency games which involve illiterates in a non-threatening approach to literacy.
7. BINGO: Describes bingo-like fluency games for words and numerical operations.
8. MATH FLUENCY GAMES: Describes a variety of simple games which provide practice in basic arithmetic operations.
9. LETTER FLUENCY GAMES: Describes a variety of simple games which provide practice in basic literacy skills.
10. TABACUNDO - BATTERY POWERED DIALOGUE: Describes uses of tape recorder for feedback and programming in a rural radio school program.
11. THE FACILITATOR MODEL: Describes the facilitator concept for community development in rural Ecuador.
12. PUPPETS AND THE THEATRE: Describes the use of theatre, puppets and music as instruments of literacy and consciousness awareness in a rural community.
13. FOTONOVELLA: Describes development and use of photo-literature as an instrument for literacy and consciousness raising.
14. THE EDUCATION GAME: Describes a board game that simulates inequities of many educational systems.
15. THE FUN BUS: Describes and NFE project in Massachusetts that used music, puppetry and drama to involve local people in workshops on town issues.
16. FIELD TRAINING THROUGH CASE STUDIES: Describes the production of actual village case studies as a training method for community development workers in Indonesia.
17. PARTICIPATORY COMMUNICATION IN NONFORMAL EDUCATION: Discusses use of simple processing techniques for information sharing, formative evaluation and staff communication.
18. BINTANGANDA - A GAME PROCESS FOR COMMUNITY DEVELOPMENT: Describes an integrated community development approach based on the use of simulation games.
19. USING CONSULTANTS FOR MATERIALS DEVELOPMENT: Describes an approach to selecting and utilizing short-term consultants for materials development.
20. DESIGNING AND USING SIMULATIONS FOR TRAINING: Outlines steps involved in designing and utilizing simulations. Presents two simulations in detail.
21. Q-SORT AS NEEDS ASSESSMENT TECHNIQUE: Describes how a research techniques can be adapted for needs assessment in nonformal education.
22. THE LEARNING FUND - INCOME GENERATION THROUGH NFE: Describes a program which combines education and income generation activities through learning groups.
23. GAME OF CHILDHOOD DISEASES: Describes a board game which addresses health problems of young children in the Third World.
24. ROAD-TO-BIRTH GAME: Describes a board game which addresses health concerns of Third World women during the prenatal period.
25. DISCUSSION STARTERS: Describes how dialogue and discussion can be facilitated in community groups by using simple audio-visual materials.
26. RECORD KEEPING FOR SMALL RURAL BUSINESSES: Describes how facilitators can help farmers, market sellers and women's groups keep track of income and expenses.
27. COMMUNITY NEWSPAPER: Describes how to create and publish a community-level newspaper in a participatory fashion.

CIE Publications Officer
285 Hills South
University of Massachusetts
Amherst, MA 01003 USA

This technical notes describes how to use, make, and train teachers to use and modify the **Skills Drills** material.

Skills Drills is an effective drill and practice activity that does not use consumable materials. It provides immediate feedback to the learner and can be easily modified for use in many curriculum areas. Adapted from BELMEKO, a game produced in Indonesia by Taman Karya Bhakti, by the USAID sponsored BANFES Project in Lesotho, the game proved to be so well received that after one year of testing the material in 100 schools 30,000 sets were requested for nationwide distribution.

Although the origins of the game remain obscure, the authors wish to express appreciation to the Taman Karya Bhakti group of Yogyakarta, Indonesia. Their innovative idea brought to Africa by children has become a rich resource for new and fun classroom activities.

The authors wish to express their sincere thanks to the Government of Lesotho, USAID and the Basic and Nonformal Education (BANFES) Project without whose support and assistance so many useful ideas and materials would not have been developed. Finally, the authors wish to convey their gratitude to the dedicated professionals in Lesotho with whom they had the privilege to work over the two years it took to develop, test and mass produce this material. Without their enthusiasm, willingness, and competence this material never would have been produced and, via this technical note, shared with educators around the world.

Authors' Preface

One of the authors first came across an educational game called BELMEKO in a small toy store in one of Indonesia's provincial capitals. Impressed by the originality of its design she bought a set which quickly became a favorite with her own children. The game was produced by Taman Karya Bhakti, a private community development organization which generates income for its activities by producing and selling educational toys.

Several years later, the author was serving on a educational project in Lesotho (a tiny mountain Kingdom in Southern Africa). Teachers there expressed a need for learning activities where learners could correct their own mistakes and be able to reuse the learning materials over and over to improve math skills. The author realized that one potential solution lay in her own children's toy box. She showed the game to a team working to develop and adapt supplementary classroom materials. The team thought the game had potential and included it as part of its efforts. The adaptations of BELMEKO (an acronym from the Indonesian words meaning study, training and control) proved to be so successful that teachers renamed it Makhona-Tsohle which means "the medicine that cures everything."

Copyright 1989 by the
Center for International Education
All Rights Reserved
Printed in the United States of America

ISBN 0-932288-81-2

TABLE OF CONTENTS

Background, Need & Purpose 1

Components 4

How to Play **Skills Drills** 6

- The Method 6
- The Self Check 10

Usage 12

Designing Problems Sets 14

Training Teachers in Lesotho to Use **Skills Drills** 19

Costs and Benefits 22

Appendix 24

- Instructions to make **Skills Drills** 25
- Tile Patterns 29
- Master Pattern Sheets 30

BACKGROUND, NEED & PURPOSE

Skills Drills is unusual. Repetitive learning materials are often modifications of familiar games. **Number Bingo** in this publication series [CIE Technical Note #7], for example, is a variation of a well known American pastime. Prior experience with the form of a game enables teachers to grasp quickly how to make, adapt and use the materials. **Skills Drills** enjoys no such familiarity. Everything about it is new; its format, its structure, and its rules. Teachers need to spend some time to master the idea of the game as well as its educational applications before using it in the classroom. Once understood, the basic concept lends itself to an exciting variety of applications.

Skills Drills is described as a non-consumable, self correcting math skills practice material:

- **non-consumable** because its three parts (a wooden box containing tiles, a question booklet and a packet of solution sets) are used over and over again;
- **self correcting** because the pupil can identify errors without assistance; and,
- **skills practice material** because it is designed to supplement an existing textbook or primer.

Since the time invested in developing the prototype for **Skills Drills** is best recovered by producing a **minimum** of 25 copies, this technical note is written primarily for individuals or groups responsible for producing materials for several classrooms or NFE groups.

The **maximum** number of **Skills Drills** an organization can produce is limited by the woodworking and printing facilities available. The wooden parts of the set were produced at the wood shop of a local high school and proved to be quite a good source of income for students at that school as well as for men in a nearby village. The printed portion was produced in the offset print shop of Lesotho's Instructional Materials Resource Centre. In

Indonesia, the game is produced by a rural cooperative and is a major source of income for their community development programs.

It is so time consuming to produce Skills Drills that you may well ask, "why bother?" In Lesotho, educators bothered because teachers requested adaptable supplementary materials to help pupils master math concepts.

Skills Drills is not an instructional material, as it does not teach math facts, algorithms or concepts. The Mathematics Subject Panel in Lesotho has spent the better part of a decade developing, testing and distributing an improved math curriculum -- including textbooks and pupil workbooks -- to help teachers instruct topics in primary mathematics. During the training workshops where teachers were introduced to the new curriculum, many teachers indicated that they would welcome additional materials to give their students extra drill-and-practice in particular areas. **Skills Drills** was developed to fill that specific niche.

In common with their counterparts in many poor countries around the world, teachers in Lesotho cope with extremely difficult conditions. Throughout the Kingdom, many primary school teachers work with classes in excess of 90 pupils/class. Multi-grade classes are also common throughout rural and peri-urban areas. Under these conditions, the most useful kind of supplementary learning materials are those that can be used by children singly or in small groups independent of teacher supervision.

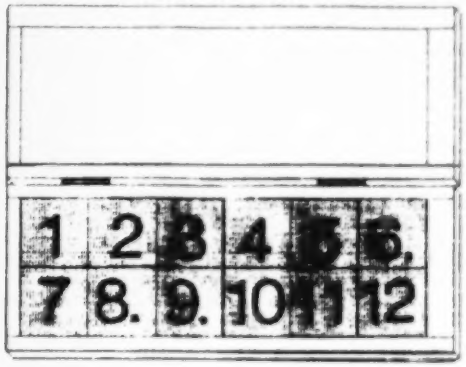
Paper and pencils are scarce in some parts of Lesotho and are quite expensive for schools and families. A supplementary drill and practice material which does not depend upon chalk, pens, paper or other consumable items makes good sense to schools operating on very limited budgets. **Skills Drills** does not rely on consumable items and one set can serve in a classroom for years.

In short, **Skills Drills** was developed to strengthen the drill-and-practice component of a comprehensive math curriculum newly introduced in Lesotho. Given the conditions of the country, the most useful kind of material needed to be one that children could use independent of the teacher. **Skills Drills** proved well adapted to the particular situation and conditions of primary math education in Lesotho.

COMPONENTS

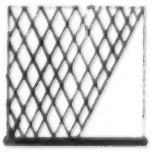
Each **Skills Drills** sets consists of three components:

- ✓ A box containing 12 numbered tiles

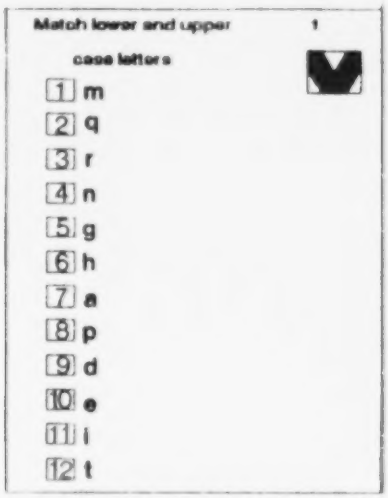


- ✓ Each tile has a number one 1 side,

and a portion of a pattern on the back



- A booklet containing sets of drill and practice questions. Each page has one set of 12 questions.



- A set of solution cards. Each card corresponds to 1 page of practice questions in the booklet,

and is designed to fit inside the lid of the game box.

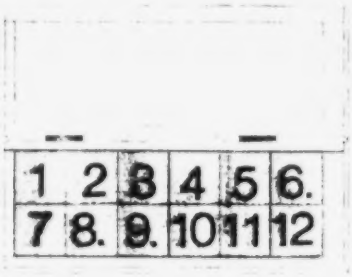
[For instructions on how to make each component please refer to the Appendix.]

HOW TO PLAY SKILLS DRILLS

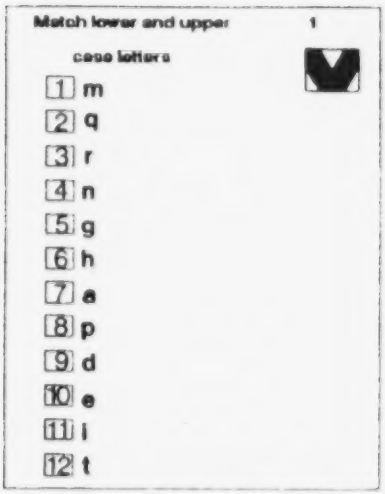
THE METHOD

Although **Skills Drills** can be played by an individual or a small group of learners, for the sake of simplicity and clarity the following directions are written for an individual player.

1. To play **Skills Drills** the child opens the box so that the numbers on the tiles can be read.

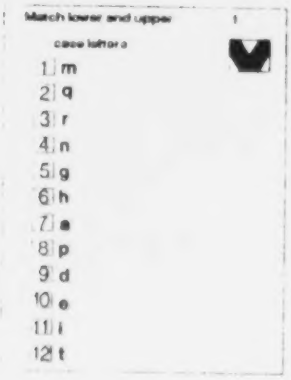


2. The child then selects a page in the booklet and locates the corresponding answer card.

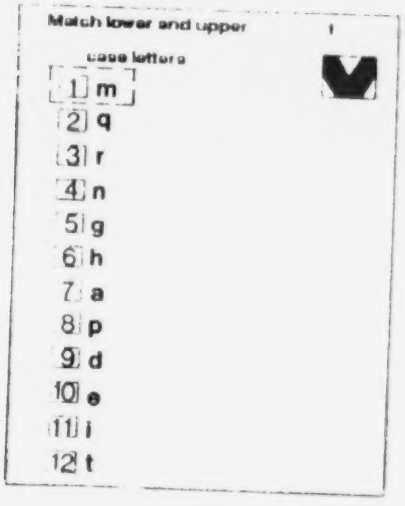


3. The child places the answer card in the empty lid of the box

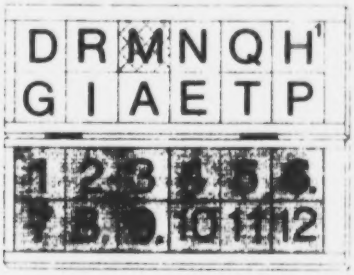
4. The child begins the practice session by reading the directions at the top of the page of the question booklet.



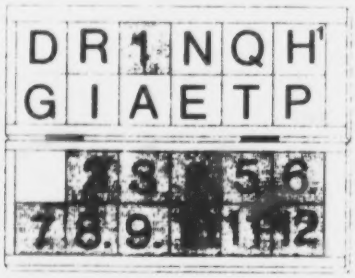
5. The child looks at problem number 1 in the question booklet and picks up tile number 1.



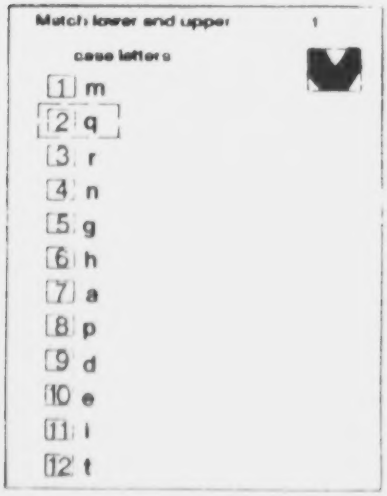
6. The child solves problem number 1 and locates the correct solution on the answer card.

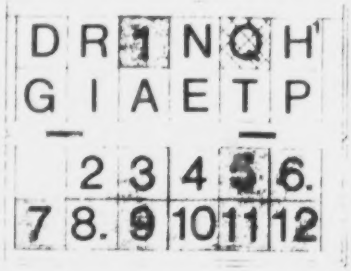


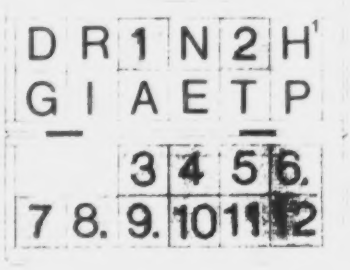
7. The child covers the correct answer to problem number 1 with tile number 1.



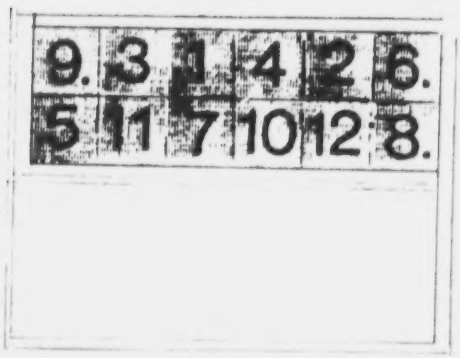
8. The child proceeds to problem number 2. She picks up tile number 2, solves problem number 2, locates the correct solution to problem number 2 on the answer card and covers the correct answer with tile number 2.







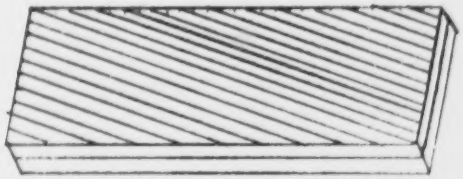
9. The child continues in this fashion until all 12 problems presented in the question booklet are answered and the answer card is entirely covered with numbered tiles.



THE SELF CHECK

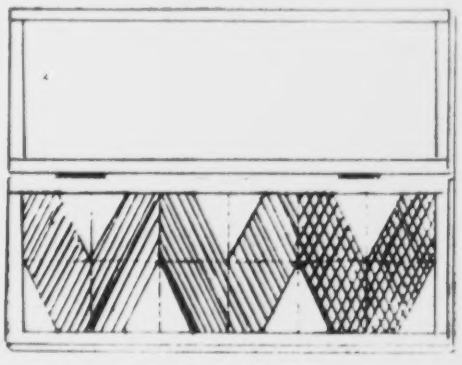
When all problems have been solved and the answer card is entirely covered with numbered tiles the child...

10. closes the box,

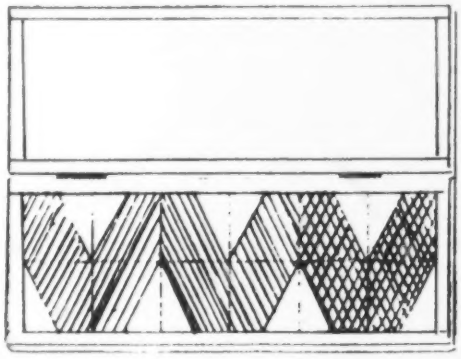


11. turns the box over,

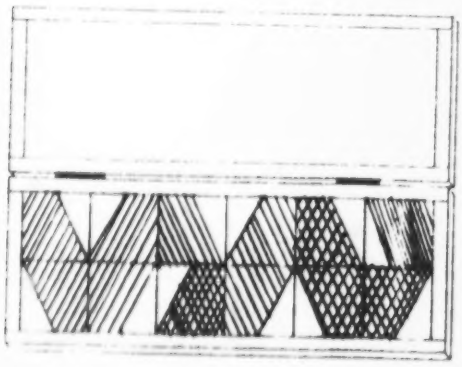
12. opens the box and removes the solution card.



13. If all the problems are correctly answered, the child will see one basic pattern repeated 3 times in 3 different colors.



14. If she has answered problems incorrectly, she will see a pattern broken by shape or by color.



USAGE

As is typical for drill and practice materials, **Skills Drills** can be used without direct teacher supervision. After a topic has been taught to the class, pupils, working individually or in small groups of up to 5, can practice their mastery with a set of **Skills Drills**. Teachers can incorporate this fluency material into their classroom management in a variety of ways. Here are some suggestions for using **Skills Drills** recorded at in-service teacher training workshops held in Lesotho.

- Ability and multi-grade groupings.
- To occupy a portion of the class while the teacher is working with another group or with another class.
- Individualizing programs.
- To occupy faster pupils while the rest of the class is completing an assignment.
- In situations where there is a high rate of absenteeism or a wide range of ability, a teacher can use **Skills Drills** for remedial work while instructing pupils at a more advanced level.
- Improving pupil attention.

- Interesting variation to traditional drill and practice methods will increase pupils' attention to material and their mastery of basic skills.

- Controlling momentum.

- The opportunity to vary the pace of classroom activities can improve the flow of events and pupil motivation and interest.

However a teacher incorporates **Skills Drills** into her classroom, she would be careful to give pupils problem sets that review material already mastered. **Skills Drills** is not a self-instructional material. It does not recognize creativity of thought or expression but rather works within a narrow range of themes requiring one specific, correct answer. Rather than diagnose error patterns, **Skills Drills** provides the pupil with feedback on whether the answers are "right or wrong."

DESIGNING PROBLEMS SETS

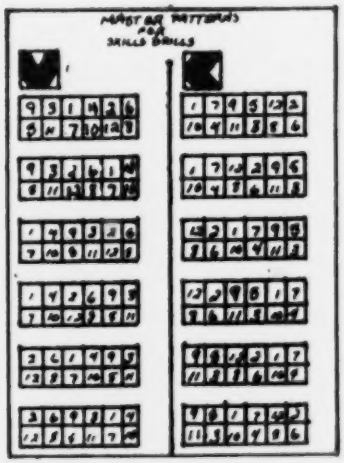
Since **Skills Drills** is based upon recognizing one to one relationships, its format limits its usefulness to curriculum areas which can be tested by using questions that having a single correct answer. As such, **Skills Drills** is particularly well suited for use in areas of primary Math which is dependent on memorization of number facts and mastery of basic algorithms or language arts activities such as synonyms, prepositions, and matching letter shapes are suitable as are drills in pairing countries with capitals and second language vocabulary building,

Skills Drills can be used with lower primary children once they can identify numerals 1 through 12. Lower grades have used the material to reinforce basic number facts, shape, sizes, etc. Older pupils have used the same material to identify equivalences of fractions, apply division and multiplication algorithms, work computations involving currency and time, etc.

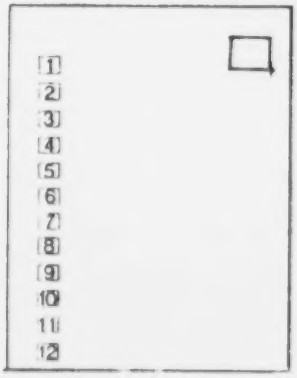
When designing problem sets look for topic areas that can be described by clear, unambiguous, one to one relationships. **Skills Drills** simply does not work if the problem sets contains questions for which there is more than one correct answer, two questions for which there is the same answer or unclear questions. Also, it is not an effective material for comparing or contrasting more than two items at a time, or for studying abstract concepts.

To design your first problem sets and solution cards for **Skills Drills**, you will need:

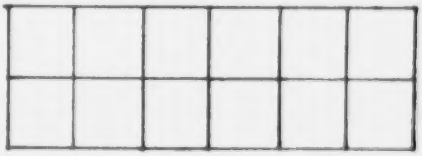
- Master Pattern Sheet with tile configurations.



- Question Sheet blanks



- Solution Card blanks



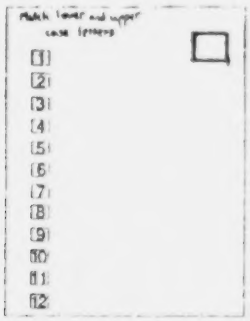
After you organize these materials, just follow the steps outlined below to design a new exercise for **Skills Drills:**

1. Select a topic.

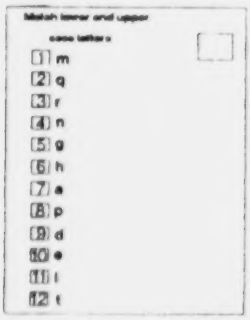
   Example: **Matching Letters**

2. Write directions which can be applied to 12 ——→ questions at the top of the blank Question Sheet

   Match lower case and upper case letters.

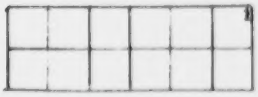


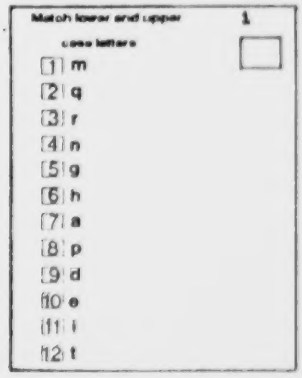
3. Write 12 unambiguous questions that have 12 different answers on the question sheet.



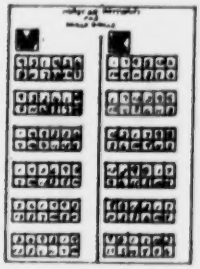
15

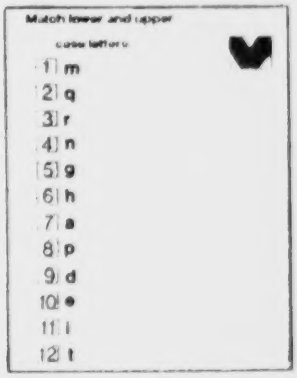
4. Write page number in upper right hand corner of both Question Sheet and Solution Card.





5. Choose a geometric pattern and tile order from the Master Pattern Sheet and draw that pattern in the box to the right of the questions.



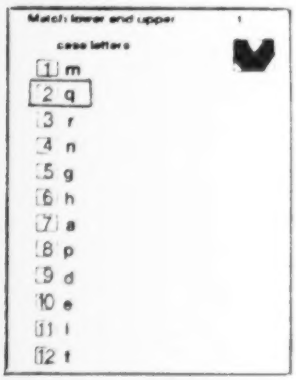


6. Consulting the tile order Master Pattern Sheet, find the position for the answer to question 1.

9	3		4	2	6
5	11	7	10	12	8

7. Find the corresponding position for the answer to question 1 on the blank Solution Card and write the answer to question 1 in that spot.

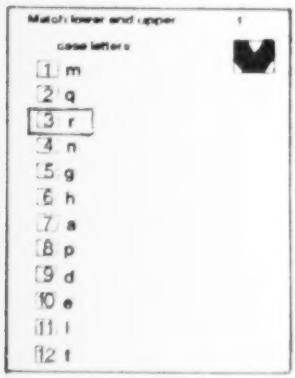
Follow the same steps for question 2. Locate the position for the answer to question 2 on the Master Pattern Sheet, find the corresponding position on the blank Solution Card and write the answer to question 2 in that square.



9	3	1	4	2	6
5	11	7	10	12	8

		M		Q	

Again, repeat the steps in sequence for question 3 through question 12. After the question sheet and solution cards are filled in, check the problem and solutions by working through them using the game boxes and numbered tiles.



9	3	1	4	2	6
5	11	7	10	12	8

	R	M		Q	

• • IMPORTANT NOTE • •

All solutions must be different and each solution must answer exactly one question.

TRAINING TEACHERS IN LESOTHO TO USE SKILLS DRILLS

Teachers in Lesotho were interested in **Skills Drills** because their large, often multi-grade classes enjoy the use of few supplementary materials. When the authors began their work with BANFES in Lesotho, a new elementary Math text and workbook series was being introduced which, though excellent, could still benefit from additional formal skills practice activities. Therefore, **Skills Drills** was developed not as an instructional material but is designed to reinforce other materials.

After several months of pre-testing prototypes in 100 schools, the authors were invited to introduce the material at several in-service training workshops which were held periodically throughout the country. While planning the training sessions, she tested various means for introducing the materials with teachers. During these training-design pre-tests, she found that teachers mastered the game more easily if the examples were drawn from any familiar topic **except mathematics.**

During the training for the 100 trial schools, the authors used examples taken directly from the Indonesian version that focused on recognizing similarity in shape despite slight differences in sizes. Although the audience was accustomed to sorting objects according to large differences in size, the examples used were not dissimilar enough to be sorted easily.

Additionally, difficulties were encountered when I tried to introduce **Skills Drills** using basic number facts. For example, If question number 1 was 12 - 6 = _____, the tendency was to pick up tile number 6 and place it over the 6 on the answer card instead of placing tile number 1 over the answer 6. The teachers had to get used to placing tile number 1 over the solution to question 1, tile 2 over the solution to question 2..., before they could consistently work through math exercises successfully.

For teachers in Lesotho I found that the best training exercises were: syllable matches, shape identification, English and Sesotho vocabulary words, and geography facts taken from Lesotho. Only after I had gone through all of these did I start on math, but by that time the teachers were already in the habit of placing the numbered tiles on the solutions to the corresponding numbered questions, so 1, tile 2 on the solution to question 2 ... tile 12 on the solution to question 12.

Because the form of **Skills Drills** is new to teachers, I found it was easiest for them to master it. Each trainee had her or his own set to work with. One of the trainers demonstrated the **Skills Drills** technique using a large set at the front of the room. Meanwhile, another trainer worked with the participants at their seats. Because the trainees were able to duplicate each step of example demonstrations, they quickly caught on to the idea and method of **Skills Drills**.

The teachers were delighted with being able to check their work immediately by turning over the box and checking the pattern that appeared. The room was full of laughter for work well done and an occasional groan of disappointment when a mistake was discovered. After working with the materials for an hour, the teachers began to think of other applications for **Skills Drills**. Representatives for the National Curriculum Development Center as well as the teachers saw how it could be adapted to each of the subjects in the curriculum. When I asked for suggestions for a new name for the activity, they unanimously selected Makhona-Tsohle, a Sesotho phrase for "a medicine that cures everything." All of the participants were anxious to learn how to design their own questions and answer cards.

On the first day of the training, I covered playing **Skills Drills** and discussed ways of using it in the classroom. On the second day I introduced methods of designing new problem sets and solution cards. The session was introduced with a quick review of how **Skills Drills** works, followed by another hands on opportunity for the teachers to practice what they learned. Each teacher was given:

Master Pattern Sheet

Blank Question Sheet

Blank Solution Card

Together, we chose a topic and walked through all of the steps described elsewhere in this technical note to design problems sets. Again, one trainer worked on a large set at the front of the room while another trainer worked with the teachers at their seats. After the problems sets were developed, the teachers checked what they had done by trying out their work on **Skills Drills** sets. Again, there was laughter and applause for jobs well done. The teachers were so enthusiastic about their new skill that they volunteered to set up an additional evening session to design more exercises for **Skills Drills**.

When evaluating the training, the participants felt that the easy pace of the sessions, the opportunity to practice what they were learning immediately, and their familiarity with the content of the problems all aided to their learning.

COSTS AND BENEFITS

Based on my experience in Lesotho adapting **Skills Drills**, training teachers to develop applications for its use, and watching pupils use the material to master skills in a variety of classrooms, have been able to draw certain conclusions about its costs and benefits.

Costs

--- The extensive development time makes **Skills Drills** most cost effective for medium scale or large scale runs.

--- To make usable copies of the game you need precision woodworking equipment and a supply of plywood. Additionally, the cost of the game will vary depending upon the local cost of wood products.

--- As with any supplementary material, the success of **Skills Drills** is dependent upon the availability of good texts and pupil workbooks.

--- As the game assumes a one to one relationship between the problems and solutions, the curriculum areas to which **Skills Drills** applies is limited.

--- Training teachers to use it properly and to develop appropriate applications is a time consuming but critical part of the process of introducing non-consumable skills mastery materials into classrooms which lack precisely those kind of articles.

Benefits

--- **Skills Drills** does not rely upon paper, pencils or other consumable materials, therefore all its costs are production costs and can be amitorized over several years.

--- Its uncommon format makes it attractive to children and teachers and hence assures a more frequent use than less appealing drill-and-practice materials.

--- **Skills Drills** allows teachers to vary their classroom management strategies by encouraging more individual and small group activities, varying the momentum of instruction, and sustaining pupils attention to normally routine tasks.

--- **Skills Drills** is not limited to one subject and can be applied to any area of instruction in which there are clear right and wrong answers to specific sub-skill questions.

--- Question sets can be prepared by either a central team or by individual teachers. By allowing teachers to produce their own problem sets, **Skills Drills** can respond to precisely those areas which a particular teacher finds difficult.

APPENDIX

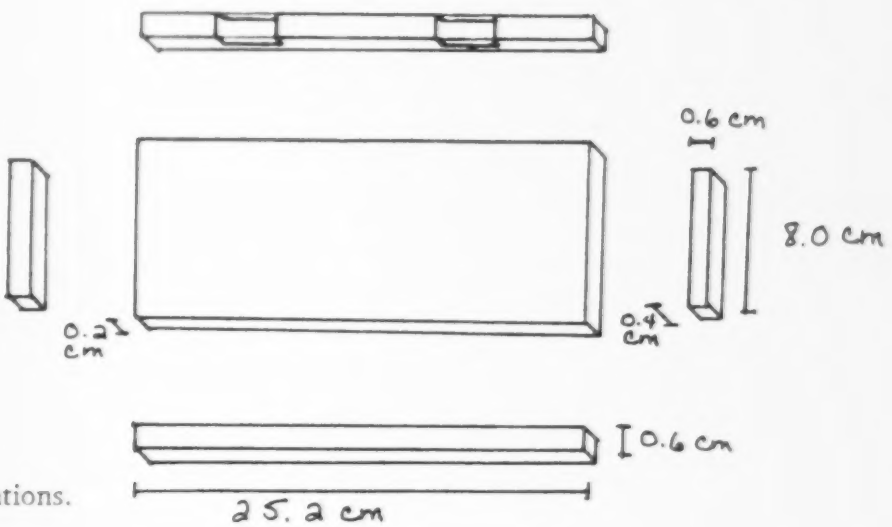
INSTRUCTIONS TO MAKE SKILLS DRILLS BOX AND TILES

MATERIALS:

5mm plywood (or equivalent) 26 cm X 36 cm
hinge material (leather, heavy cloth) 4 cm X 4 cm
wood glue
3 colours of paint

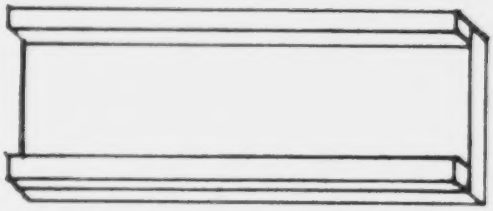
INSTRUCTIONS

TOP / BOTTOM

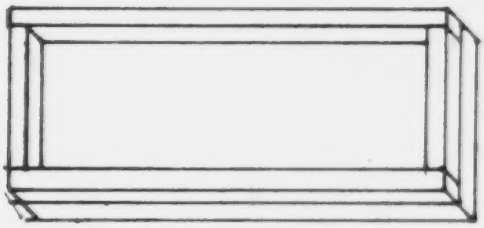


- Cut wood to specifications.

- Glue front and back sides onto flat surface of bottom matching corners.



- Glue sides to flat surface of bottom ends of front and back sides.

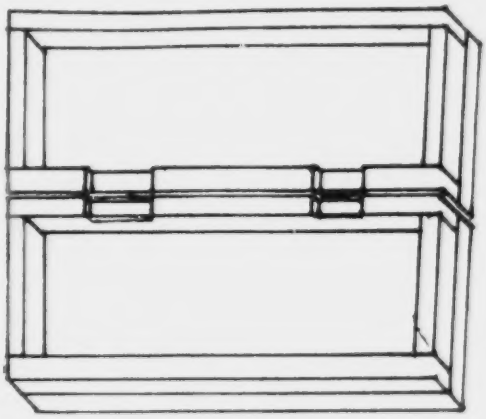


- Repeat to make top.

Hinges

- Place finished top and bottom next to each other with sides facing up and long edges touching.

- Mark spaces for hinges in the same position on touching long sides.

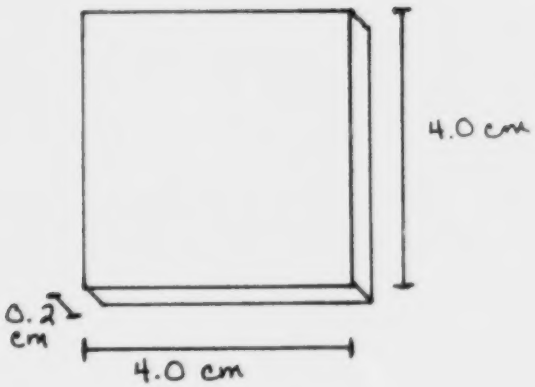


- Chisel grooves for hinges in spaces marked.

- Glue hinge material into grooves.

Tiles

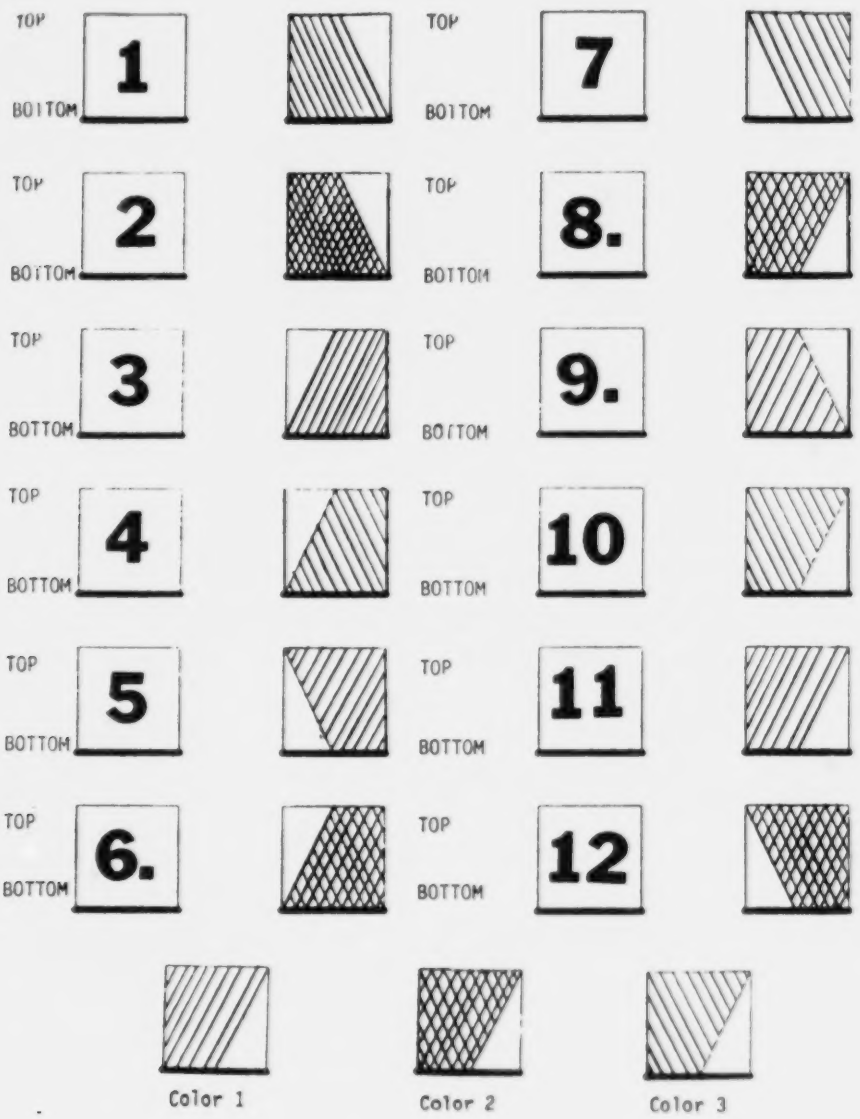
- Cut 12 squares [4cm X 4cm].



- Sand edges, round corners so that the 12 tiles fit easily into the box in any combination.

- Paint tile **exactly** according to the diagram on the next page.

TILE PATTERNS



IMPORTANT

Each tile must be painted exactly as shown in the diagrams above!

MASTER PATTERN SHEET
FOR
SKILLS DRILLS

1	4	9	3	2	6
7	10	5	11	12	8

1	4	2	6	9	3
7	10	12	8	5	11

2	6	1	4	9	3
12	8	7	10	5	11

2	6	9	3	1	4
12	8	5	11	7	10

2	6	1	4	9	3
12	8	7	10	5	11

2	6	9	3	1	4
12	8	5	11	7	10

1	7	9	5	2	12
10	4	11	3	8	6

1	7	2	12	9	5
10	4	8	6	11	3

2	12	1	7	9	5
8	6	10	4	11	3

2	12	9	5	1	7
8	6	11	3	10	4

9	5	2	12	1	7
11	3	8	6	10	4

9	5	8	7	2	12
11	3	10	4	8	6

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

10	7	11	5	8	12
1	4	9	3	2	6

10	7	8	12	11	5
1	4	2	6	9	3

8	12	10	7	11	5
2	6	1	4	9	3

8	12	11	5	10	7
2	6	9	3	1	4

11	5	8	12	10	7
9	3	2	6	1	4

11	5	10	7	8	12
9	3	1	4	2	6

7	10	5	11	12	8
4	1	3	9	6	2

7	10	12	8	5	11
4	1	6	2	3	9

12	8	7	10	5	11
6	2	4	1	3	9

12	8	5	11	7	10
6	2	3	9	1	4

5	11	12	8	7	10
3	9	6	2	1	4

5	11	7	10	12	8
3	9	1	4	6	2

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

4	1	3	9	6	2
7	10	5	11	12	8

4	1	6	2	3	9
7	10	12	8	5	11

6	2	4	1	3	9
12	8	7	10	5	11

6	2	3	9	4	1
12	8	5	11	7	10

3	9	6	2	4	1
5	11	12	8	7	10

3	9	4	1	6	2
5	11	7	10	12	8

1	4	9	3	2	6
10	7	11	5	8	12

1	4	2	6	9	3
10	7	8	12	11	5

2	6	1	4	9	3
8	12	10	7	11	5

2	6	9	3	1	4
8	12	11	5	10	7

9	3	2	6	1	4
11	5	8	12	10	7

9	3	1	4	2	6
11	5	10	7	8	12

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

4	1	3	9	6	2
10	7	11	5	8	12

4	1	6	2	3	9
10	7	8	12	11	5

6	2	4	1	3	9
8	12	10	7	11	5

6	2	3	9	4	1
8	12	11	5	10	7

3	9	6	2	4	1
11	5	8	12	10	7

3	9	4	1	6	2
11	5	10	7	8	12

7	10	5	11	12	8
1	4	9	3	2	6

7	10	12	8	5	11
1	4	2	6	9	3

12	8	7	10	5	11
2	6	1	4	9	3

12	8	5	11	7	10
2	6	9	3	1	4

5	11	12	8	7	10
9	3	2	6	1	4

5	11	7	10	12	8
9	3	1	4	2	6

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

10	7	11	5	8	12
4	1	3	9	6	2

10	7	8	12	11	5
4	1	6	2	3	9

8	12	10	7	11	6
6	2	4	1	3	9

8	12	11	5	10	7
6	2	3	9	4	1

11	5	8	12	10	7
3	9	6	2	4	1

11	5	10	7	8	12
3	9	4	1	6	2

4	10	3	11	6	8
7	1	5	9	12	2

4	10	6	8	3	11
7	1	12	2	5	9

6	8	4	10	3	11
12	2	7	1	5	9

6	8	3	11	4	10
12	2	5	9	7	1

3	11	6	8	4	10
5	9	12	2	7	1

3	11	4	10	6	8
5	9	7	1	12	2

33

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

10	1	11	9	8	2
7	4	5	3	12	6

10	1	8	2	11	9
7	4	12	6	5	3

8	2	10	1	11	9
12	6	7	4	5	3

8	2	11	9	10	1
12	6	5	3	7	4

11	9	8	2	10	1
5	3	12	6	7	4

11	9	10	1	8	2
5	3	7	4	12	6

4	7	3	5	6	12
1	10	9	11	2	8

4	7	6	12	3	5
1	10	2	8	9	11

6	12	4	7	3	5
2	8	1	10	9	11

6	12	3	5	4	7
2	8	9	11	1	10

3	5	6	12	4	7
9	11	2	8	1	10

3	5	4	7	6	12
9	11	1	10	2	8

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

7	1	5	9	12	2
4	10	3	11	6	8

7	1	12	2	5	9
4	10	6	8	3	11

12	2	7	1	5	9
6	8	4	10	3	11

12	2	5	9	7	1
6	8	3	11	4	10

5	9	12	2	7	1
3	11	6	8	4	10

5	9	7	1	12	2
3	11	4	10	6	8

10	4	11	3	8	6
1	7	9	5	2	12

10	4	8	6	11	3
1	7	2	12	9	5

8	6	10	4	11	3
2	12	1	7	9	5

8	6	11	3	10	4
2	12	9	5	1	7

11	3	8	6	10	4
9	5	2	12	1	7

11	3	10	4	8	6
9	5	1	7	2	12

MASTER PATTERN SHEET

FOR

SKILLS DRILLS

7	4	5	3	12	6
10	1	11	9	8	2

7	4	12	6	5	3
10	1	8	2	11	9

12	6	7	4	5	3
8	2	10	1	11	9

12	6	5	3	7	4
8	2	11	9	10	1

5	3	12	6	7	4
11	9	8	2	10	1

5	3	7	4	12	6
11	9	10	1	8	2

1	10	9	11	2	8
4	7	3	5	6	12

1	10	2	8	9	11
4	7	6	12	3	5

2	8	1	10	9	11
6	12	4	7	3	5

2	8	9	11	1	10
6	12	3	5	4	7

9	11	2	8	1	10
3	5	6	12	4	7

9	11	1	10	2	8
3	5	4	7	6	12

This Technical Note is part of a series
published by the
Center for International Education
285 Hills House South
University of Massachusetts
Amherst, MA 01003-USA

For a complete list of all CIE publications or any other information, please write us!

Printed in the United States of America.
All Rights Reserved.
ISBN 0-932288-81-2

END

U.S. Dept. of Education

Office of Education
Research and
Improvement (OERI)

ERIC

Date Filmed

March 29, 1991